Claims

1. (currently amended) A combination for installing anti-slip studs, said combination comprising:

an air-filled vehicle tire comprising a tread with a rolling surface, the tread comprising a plurality of premade stud recesses;

at least one anti-slip stud:

(A) comprising an outer head and an inner head, the inner head comprising a non-round bottom flange and the outer head comprising a top bowl, the bottom flange being deeper from the rolling surface and the top bowl being nearer to the rolling surface when the stud is installed in said tread; and

(B) having a stud length and a stud center line substantially parallel to said stud length, the bottom flange having a cross-sectional shape perpendicular to the stud center line, wherein the cross-sectional shape of the bottom flange is comprised of: (i) a number of at least two first side portions with center regions at first respective distances from said stud center line, and (ii) a number of at least two second side portions with center regions at second respective distances from said stud center line, the second respective distances being greater than the first respective distances; and

an installation tool by which said anti-slip stud is installed in said tread, the installation tool comprising a number of jaw fingers equal to twice the number of said second side portions, the jaw fingers each comprising a base portion and a tip portion with the tip portions defining a stud capturing space therebetween, and said jaw fingers being charged by a radial force against each other; the installation tool further comprising a plunger pin positioned between and movable relative to the jaw fingers by an axial force towards the stud recess;

wherein said at least one anti-slip stud is drivable into and through the stud capturing space by actuation of the plunger pin, wherein the at least one anti-slip stud enters the stud capturing space in a first stud orientation with respect to the stud center line, and wherein by contact of each jaw finger with a respective one of the at least two first and the at least two second side portions of the bottom flange, said at least one anti-slip stud is rotated about the stud center line relative to the jaw fingers from the first stud orientation to a second, predetermined

stud orientation, if the first stud orientation differs from the predetermined stud orientation, as said stud is driven through the stud capturing space.

2. (original) A combination according to claim 1, wherein the number of said second side portions is two, and the number of said jaw fingers is four.

3. (original) A combination according to claim 1, wherein said second side portions are gradually or steplessly changing into said first side portions.

4. (original) A combination according to claim 3, wherein said second side portions and said first side portions together form an oval.

5. (original) A combination according to claim 1, further comprising a separate hard cermet piece in said anti-slip stud, which hard cermet piece extends from said outer head to at least the length of the top bowl, and has a non-round cross-sectional shape in a plane perpendicular to the stud center line.

6. (previously presented) A combination according to claim 5, wherein said non-round cross-sectional shape of the hard cermet piece is substantially elongate, the hard cermet piece having a largest width and being oriented in the anti-slip stud so that either (i) said largest width is perpendicular to the second respective distances of the bottom flange; or (ii) said largest width is turned by a toe-out angle with respect to the second respective distances.

7. (original) A combination according to claim 1, wherein said stud recesses have a bottom expansion for the bottom flange of the anti-slip studs, said bottom expansion having a shape that is substantially similar to that of the bottom flange.

8. (previously presented) A combination according to claim 1, wherein said stud recesses each have an at least partly circular inner surface having a hole diameter.

9. (original) A combination according to claim 1, wherein said jaw fingers of the installation tool have a jaw length that is substantially longer than the stud length of the anti-slip studs, and a mutual jaw center line that substantially concurs with the center line of the anti-slip studs to be installed.

10. (original) A combination according to claim 9, wherein said jaw fingers are radially movable towards said jaw center line and away therefrom.

11. (previously presented) A combination according to claim 8, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, the tip portions of the jaw fingers jointly form a transversal tip dimension that is larger than said hole diameter, but not more than a first tolerance.

12. (previously presented) A combination according to claim 11, wherein said jaw fingers have cross-sections that are radially getting larger from said tip portions in the direction of the base portions with respect to the jaw center line.

13. (previously presented) A combination according to claim 9, wherein the plunger pin is movable within the stud receiving area and stud orienting area in the direction of said jaw center line while the jaw fingers are radially moved away from each other.

14. (previously presented) A combination according to claim 1, wherein said second respective distances of the anti-slip stud bottom flange extend to outside an envelope curve drawn around the jaw fingers within a second tolerance when the anti-slip stud is in the stud orienting area defined by the jaw fingers.

15. (original) A combination according to claim 1, wherein said bottom flange has beveled edges.

16. (currently amended) A combination for installing anti-slip studs, said combination comprising:

an air-filled vehicle tire comprising a tread with a rolling surface and a plurality of premade stud recesses in the tread;

at least one anti-slip stud:

(A) comprising an outer head and an inner head, the inner head comprising a non-round bottom flange and the outer head comprising a top bowl, the bottom flange being deeper from the rolling surface and the top bowl being nearer to the rolling surface when the stud is installed in said tread; and

(B) having a stud length and a stud center line substantially parallel to said stud length, the bottom flange having a cross-sectional shape perpendicular to the stud center line, wherein the cross-sectional shape of the bottom flange is comprised of: (i) at least two side portions with center regions at first respective distances from said stud center line, and (ii) at least two edge portions each formed at a respective intersection of adjacent ends of two of the side portions, the edge portions being located at second respective distances from said stud center line, the second respective distances being greater than the first respective distances; and

an installation tool by which said anti-slip stud is installed in said tread, the installation tool comprising a number of jaw fingers equal to the number of said edge portions, the jaw fingers each comprising a base portion and a tip portion with the tip portions defining a stud capturing space therebetween, and said jaw fingers being charged by a radial force against each other; the installation tool further comprising a plunger pin positioned between and movable relative to the jaw fingers by an axial force towards the stud recess;

wherein said at least one anti-slip stud is drivable into and through the stud capturing space by actuation of the plunger pin, wherein the at least one anti-slip stud enters the stud capturing space in a first stud orientation with respect to the stud center line, and wherein by contact of each jaw finger with a respective one of the at least two side portions of the bottom

flange, said at least one anti-slip stud is rotated about the stud center line relative to the jaw fingers from the first stud orientation to a second, predetermined stud orientation, if the first stud orientation differs from the predetermined stud orientation, as said stud is driven through the stud capturing space.

17. (original) A combination according to claim 16, wherein the number of said edge portions is at least three but no more than six.

18. (previously presented) A combination according to claim 16, wherein the number of said edge portions is:

three and the number of said jaw fingers is three; or

four and the number of said jaw fingers is four; or

five and the number of said jaw fingers is five; or

six and the number of said jaw fingers are six.

19. (original) A combination according to claim 16, wherein said edge portions have a radius of curvature.

20. (previously presented) A combination according to claim 16, wherein said side portions are convex or straight or concave.

21. (previously presented) A combination according to claim 16, further comprising a separate hard cermet piece in said anti-slip stud, wherein the hard cermet piece extends from said outer head to at least the length of the top bowl and has a non-round cross-sectional shape in a plane perpendicular to the stud center line.

22. (previously presented) A combination according to claim 21, wherein said non-round cross-sectional shape of the hard cermet piece is selected from the group consisting of substantially triangular, quadrangular, pentagonal and hexagonal, wherein the non-round cross-sectional shape comprises a major dimension, and wherein the hard cermet piece is located in the anti-slip stud such that the major dimension of the cermet piece is either (i) substantially parallel

to a major dimension of the bottom flange, the bottom flange having a non-round cross-sectional shape selected from the group consisting of substantially triangular, quadrangular, pentagonal and hexagonal; or (ii) at a toe-out angle with respect to the major dimension of the bottom flange.

23. (original) A combination according to claim 21, wherein the hard cermet piece is triangular in shape and comprises three concave sides and three planar or outwardly convex edges.

24. (original) A combination according to claim 23, wherein said concave sides have side spans, and said edges have angular spans between transition points of edge planes or edge roundings and concavities of said concave sides, whereupon the ratio of the side spans to the angular spans is not more than 4:1 but at least 0.8:1.

25. (original) A combination according to claim 24, wherein the ratio of said side spans to said angular spans is not more than 3:1 but at least 1.2:1.

26. (previously presented) A combination according to claim 23, wherein said concave sides of the hard cermet piece have radii of curvature that are at least half of but not more than three times the radius of a circle drawn around and tangential to the outermost edges of said hard cermet piece.

27. (previously presented) A combination according to claim 24, wherein said convex edges have a radius of curvature that is at least half of said angular span, but not more than twice the radius of a circle drawn around and tangential to the outermost edges of said hard cermet piece.

28. (previously presented) A combination according to claim 23, wherein said triangular hard cermet piece has three major radii, and said bottom flange is triangular having three major radii, whereupon said hard cermet major radii are either parallel with the flange major radii or parallel with central intervals of the flange major radii.

29. (original) A combination according to claim 16, wherein said stud recesses have a bottom expansion for the bottom flange of the anti-slip studs, said bottom expansion having a shape that is substantially similar to that of the bottom flange.

30. (original) A combination according to claim 16, wherein said stud recesses have an at least partly circular inner surface with hole diameters.

31. (previously presented) A combination according to claim 16, wherein said jaw fingers of the installation tool have a jaw length that is substantially longer than the stud length of the anti-slip studs, and a mutual jaw center line that substantially concurs with the center line of the anti-slip studs to be installed when the stud is within the stud orienting area.

32. (original) A combination according to claim 31, wherein said jaw fingers are radially movable towards said jaw center line and away therefrom.

33. (previously presented) A combination according to claim 30, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, the tip portions of the jaw fingers jointly form a transversal tip dimension that is larger than said hole diameter, but not more than a first tolerance.

34. (previously presented) A combination according to claim 33, wherein said jaw fingers have cross-sections that are radially getting larger from said tip portions in the direction of the base portions with respect to the jaw center line.

35. (previously presented) A combination according to claim 31, wherein the plunger pin is movable within the stud capturing space in the direction of said jaw center line while the jaw fingers are radially moved away from each other.

36. (previously presented) A combination according to claim 16, wherein said second respective distances of the anti-slip stud bottom flange extends to outside an envelope curve drawn around the jaw fingers within a second tolerance when the anti-slip stud is in the stud orienting area defined by the jaw fingers.

37. (original) A combination according to claim 16, wherein said bottom flange has beveled edges.

38. (currently amended) A method for installing non-round anti-slip studs in a vehicle tire tread, said method comprising the steps of:

providing an air-filled vehicle tire with a tread and a plurality of premade stud recesses in the tread, said tire having a rotation axis line;

utilizing an installation tool comprising:

(A) at least three jaw fingers (i) each comprising a base portion and a tip portion with the tip portions defining a stud capturing space therebetween, and (ii) defining a mutual jaw center line extending between the jaw fingers, wherein the jaw fingers are radially movable away from and towards the mutual jaw center line by a radial force; and

(B) a plunger pin that is movable substantially in parallel with the jaw center line and within the stud capturing space by an axial force;

inserting the tip portions of the jaw fingers in one of the plurality of premade stud recesses;

positioning an anti-slip stud in the stud capturing space and in a first stud orientation with respect to a stud center line, the stud comprising a top bowl and a bottom flange, the bottom flange having a cross-sectional shape (i) selected from the group consisting of substantially oval and substantially polygonal that is at least partially wider than a cross-sectional shape of the top bowl and (ii) comprising at least three side portions, the anti-slip stud further comprising a non-round hard cermet piece extending from the top bowl;

moving said anti-slip stud by said axial force through the stud capturing space and into the stud recess with said plunger pin to expand the stud recess, while said jaw fingers are charged by said radial force against each other, wherein contact between the jaw fingers and the bottom

flange, as the stud is moved through the stud capturing space, causes the stud to rotate relative to the jaw fingers and the stud center line from the first stud orientation to a second, predetermined stud orientation if the first stud orientation differs from the second, predetermined stud orientation; [and]

holding the anti-slip stud in the recess with said plunger pin and simultaneously pulling the jaw fingers out of the stud recess and out from around the anti-slip stud; and

proceeding to install the next anti-slip stud in the next stud recess, or terminating the installation of the studs in the tire.

39. (currently amended) A method for installing non-round anti-slip studs in a vehicle tire tread, said method comprising the steps of:

providing an air-filled vehicle tire with a tread and a plurality of premade stud recesses in the tread, said tire having a rotation axis line;

utilizing an installation tool comprising:

(A) at least three jaw fingers (i) each comprising a base portion and a tip portion with the portions defining a stud capturing space therebetween, and (ii) defining a mutual jaw center line extending between the jaw fingers, wherein the jaw fingers are radially movable away from and towards the mutual jaw center line by a radial force; and

(B) a plunger pin that is movable substantially in parallel with the jaw center line and within the stud capturing space by an axial force;

inserting the tip portions of the jaw fingers in a first one of the plurality of premade stud recesses;

positioning a first anti-slip stud in the stud capturing space and in an initial stud orientation with respect to its stud center line, the first stud comprising a top bowl and a bottom flange, the bottom flange having a cross-sectional shape (i) selected from the group consisting of substantially oval and substantially polygonal that is at least partially wider than a cross-sectional shape of the top bowl and (ii) comprising at least three side portions, the anti-slip stud further comprising a non-round hard cermet piece extending from the top bowl, wherein the hard cermet piece is oriented in a first cermet piece orientation with respect to the flange;

moving said first anti-slip stud by said axial force through the stud capturing space and into the recess with said plunger pin to expand the first stud recess, while said jaw fingers are charged by said radial force against each other, wherein contact between the jaw fingers and the bottom flange as the stud is moved through the stud capturing space causes the stud to rotate relative to the jaw fingers and the stud center line from the initial stud orientation to a predetermined stud orientation if the initial stud orientation differs from the predetermined stud orientation;

holding the first anti-slip stud in the first stud recess with said plunger pin and simultaneously pulling the jaw fingers out of the first stud recess and out from around the first anti-slip stud;

once the jaw fingers are pulled out of the first stud recess and out from around the first anti-slip stud, maintaining at least the position of the jaw fingers of the installation tool in a constant position with respect to said rotation axis line of the tire and inserting the tip portions of the jaw fingers in a second one of the plurality of premade stud recesses;

positioning a second anti-slip stud in the stud capturing space and in an initial stud orientation with respect to its stud center line, which may be the same or different than the initial stud orientation of the first stud, the second stud comprising a top bowl and a bottom flange, the bottom flange having a cross-sectional shape (i) selected from the group consisting of substantially oval and substantially polygonal that is at least partially wider than a cross-sectional shape of the top bowl and (ii) comprising at least three side portions, the second anti-slip stud further comprising a non-round hard cermet piece extending from the top bowl, wherein the hard cermet piece is oriented in a second cermet piece orientation with respect to the flange;

moving said second anti-slip stud by said axial force through the stud capturing space and into the second stud recess with said plunger pin to expand the second stud recess, while said jaw fingers are charged by said radial force against each other, wherein contact between the jaw fingers and the bottom flange as the second stud is moved through the stud capturing space causes the second stud to rotate relative to the jaw fingers and its stud center line from its respective initial stud orientation to said predetermined stud orientation if its initial stud orientation differs from said predetermined stud orientation;

holding the second anti-slip stud in the second stud recess with said plunger pin and simultaneously pulling the jaw fingers out of the second stud recess and out from around the second anti-slip stud; and

proceeding to install the next anti-slip stud in the next stud recess, or terminating the installation of the studs in the tire.

40. (previously presented) A combination according to claim 9, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, said jaw fingers have tip portions that jointly form a transversal tip dimension that is larger than a diameter of said recess, but not more than a first tolerance.

41. (previously presented) A combination according to claim 31, wherein when the jaw fingers are in a position shifted towards said jaw center line and in mutual contact, said jaw fingers have tip portions that jointly form a transversal tip dimension that is larger than a diameter of said recess, but not more than a first tolerance.

42. (cancelled)